

CLAIMS

We claim:

1. A method for preparing a coating composition comprising:

(A) forming an aqueous-based mixture by combining:

(i) a first polymer comprising, as polymerized monomer units:

(a) 5 to 50 percent, based on weight of the first polymer, of a monoethylenically unsaturated monomer containing an acidic functional group selected from one or more of carboxylic, sulfonic and phosphonic groups;

(b) zero up to 60 percent, based on weight of the first polymer, of a (meth)acrylic monomer containing one or more pendant reactive functional groups selected from hydroxy, thiol, and amino groups;

(c) zero up to 70 percent, based on weight of the first polymer, of one or more vinylaromatic monomers;

(d) 15 to 90 percent, based on weight of the first polymer, of one or more (C₁-C₂₀)alkyl (meth)acrylate ester monomers; and

(e) zero up to 10 percent, based on weight of the first polymer, of one or more other copolymerizable monomers; and

(ii) a polyfunctional crosslinker agent comprising pendant functional groups selected from one or more of isocyanate, carbodiimide, aziridinyl and epoxy groups;

wherein, the first polymer has a number average molecular weight from greater than 50,000 up to 2,000,000; and the polyfunctional crosslinker agent is used in an amount sufficient to provide from 0.2 to 5 equivalents of pendant functional group per equivalent of corresponding pendant reactive functional group in the first polymer; and

(B) applying the aqueous-based mixture to a substrate.

2. The process of claim 1 wherein the first polymer comprises, as polymerized monomer units, 9 to 40 percent of the monoethylenically unsaturated monomer containing an acidic functional group, wherein the acidic functional group is a carboxyl group.

3. The process of claim 1 wherein the first polymer comprises, as polymerized units, from 2 to 40 percent of the (meth)acrylic monomer which is a hydroxy-functional monomer selected from one or more of hydroxyethyl methacrylate, hydroxyethyl acrylate, hydroxypropyl methacrylate and hydroxypropyl acrylate.

4. The process of claim 1 wherein the first polymer comprises, as polymerized units, from 2 to 40 percent of the (meth)acrylic monomer which is an amino-functional monomer selected from one or more of dimethylaminopropyl methacrylamide, dimethylaminopropyl acrylamide, dimethylaminoethyl methacrylate, dimethylaminoethyl acrylate, dimethylaminopropyl methacrylate and dimethylaminopropyl acrylate.

5. The process of claim 1 wherein the first polymer further comprises 1 to 75 percent, based on equivalents of carboxylic acid groups, of polyvalent metal ion.

6. The process of claim 1 further comprising adding to the aqueous-based mixture of step (A), part (ii), from 0.1 to 15 percent, based on weight of the aqueous-based mixture, of leveling agent.

7. The process of claim 1 wherein the pendant functional group of the polyfunctional crosslinker agent is an isocyanate group in an amount sufficient to provide from 0.2 to 5 equivalents of isocyanate group per equivalent of hydroxy or thiol functional group in the first polymer.

8. The process of claim 1 wherein the pendant functional group of the polyfunctional crosslinker agent is a carbodiimide group in an amount sufficient to provide from 0.2 to 5 equivalents of carbodiimide group per equivalent of carboxylic acid functional group in the first polymer.

9. The process of claim 1 wherein the pendant functional group of the polyfunctional crosslinker agent is an epoxy or aziridinyl group in an amount sufficient to provide from 0.2 to 5 equivalent of epoxy or aziridinyl group per equivalent of amino or thiol functional group in the first polymer.

10. An aqueous coating composition comprising:

(1) a first polymer comprising, as polymerized monomer units:

(a) 5 to 50 percent, based on weight of the first polymer, of a monoethylenically unsaturated monomer containing an acidic functional group selected from one or more of carboxylic, sulfonic and phosphonic groups; and

(b) zero up to 60 percent, based on weight of the first polymer, of a (meth)acrylic monomer containing one or more pendant reactive functional groups selected from hydroxy, thiol, and amino groups; and

(c) zero up to 70 percent, based on weight of the first polymer, of one or more vinylaromatic monomers; and

(d) 15 to 90 percent, based on weight of the first polymer, of one or more (C₁-C₂₀)alkyl (meth)acrylate ester monomers; and

(e) zero up to 10 percent, based on weight of the first polymer, of one or more other copolymerizable monomers;

(2) a polyfunctional crosslinker agent comprising pendant functional groups selected from one or more of isocyanate, carbodiimide, aziridinyl and epoxy groups;

(3) 0.1 to 15 percent, based on weight of the aqueous coating composition, of coalescing agent;

(4) zero up to 10 percent, based on weight of the aqueous coating composition, of additives selected from one or more of waxes, surfactants, defoamers, leveling agents, alkali-soluble resins and plasticizers; and

(5) 50 to 99 percent, based on weight of the aqueous coating composition, of water;

wherein: the first polymer has a number average molecular weight from greater than 50,000 up to 2,000,000; the polyfunctional crosslinker agent is used in an amount sufficient to provide from 0.2 to 5 equivalents of pendant functional group per equivalent of corresponding pendant reactive functional group in the first polymer; the combined amount of (1) and (2) is from 10 to 90 percent, based on weight of the aqueous coating composition; and the sum of (1), (2), (3), (4) and (5) percents add up to 100 percent.